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## IMPORTANT NOTICE

Owing to the necessity of drastically reducing the printing cost of the REVIEW to keep within the funds for the fiscal year, now drawing to a close, all "contributions" are omitted in this issue. However, it is hoped that "contributions" may be resumed later.—Editor.

## BIBLIOGRAPHY

C. FITZHUGH TALMAN, in charge of library

### RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

- American society of heating and ventilating engineers.  
Guide. 1932 ... vol. 10. New York. [c1932.] xiv, 376 p. illus. 23 cm. [Contains articles on air-conditioning.]
- Baur, Franz.  
Sonnenflecken und Witterung. p. 68-73. illus. 24 cm. (Sonderdr.: Natur und Museum, H. 3, 1932. Frankfurt a. M.)
- Blair, W. R., & Lewis, H. M.  
Radio tracking of meteorological balloons. p. 1531-1560. illus. 23 cm. (Proc. Inst. radio engin., v. 19, No. 9, Sept., 1931.)
- Dines, William Henry.  
Collected scientific papers of ... Pub. by the Royal meteorological society. [London] 1931. x, 461 p. figs. plates (fold.) port. 26 cm.
- Fortescue, C. L.  
Lightning and its effects on transmission lines. East Pittsburgh. n. d. [3], 91, [2] p. plates. 29 cm. [Manifolded.]
- Greenburg, Leonard, & Bloomfield, J. J.  
Impinger dust sampling apparatus as used by the United States public health service. [Washington. 1932.] p. 654-675. figs. plate. 23½ cm. (U. S. Pub. health service, Pub. health rep., v. 47, no. 12, Mar. 18, 1932.)

- Holborn, L., & others.  
Wärmetabellen. Ergebnisse aus den thermischen Untersuchungen der Physikalisch-Technischen Reichsanstalt. Braunschweig. 1919. 72 p. 23½ cm.
- McLennan, J. C., & others.  
Height of the polar aurora in Canada. p. 285-296. figs. plates. 26 cm. (Canadian journ. of research, v. 5, Sept., 1931.)
- Metropolitan life insurance company.  
Air conditions and the comfort of workers. New York. n. d. 20 p. illus. 19½ cm. (Industrial health series, no. 5.)
- Mosby, Håkon.  
Sunshine and radiation ... Bergen. 1932. 110 p. figs. pl. 31 cm. (Norwegian north polar exped. with the "Maud" 1918-1925, sci. results. v. 1, no. 7.)
- Nelson, A. L.  
Shelterbelts and fruit. Laramie. 1931. 23 p. illus. 23 cm. (Univ. Wyoming. Agr. exp. sta. Bull. no. 179, May, 1931.)
- Shaw, [William] Napier.  
Manual of meteorology. vol. 4. Meteorological calculus: pressure and wind. (A revised edition of part 4, 1919.) ... With the assistance of Elaine Austin. Cambridge. 1931. xx, 359, xii p. figs. 27 cm.
- Sherlock, R. H., & Stout, M. B.  
Characteristics of wind gusts. p. 20-24. figs. 29½ cm. (N. E. L. A. bulletin, Jan., 1932.)
- U. S. Bureau of standards.  
Protection of electrical circuits and equipment against lightning. Preliminary report of the sectional committee on protection against lightning. September 12, 1929. Washington. 1929. ix, 107 p. figs. plate. 20 cm. (Misc. pub. Bur. stand., no. 95.)

## SOLAR OBSERVATIONS

### SOLAR RADIATION MEASUREMENTS DURING APRIL, 1932

By HERBERT H. KIMBALL, in charge, Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January, 1932, REVIEW, page 26.

Table 1 shows that solar radiation intensities averaged above the normal intensity for April at Washington and Madison, and close to normal at Lincoln.

Table 2 shows an excess in the total solar radiation received on a horizontal surface at all stations except Twin Falls and Lincoln, which show a slight deficit, and Miami, which is very close to the normal.

Table 3 summarizes solar radiation measurements,  $I_y$  and  $I_r$  obtained by means of the yellow and red glass filters described in the February, 1932, REVIEW, and values of the coefficient of atmospheric turbidity derived therefrom. The turbidity has increased with the season, as was to be expected.

Skylight polarization measurements, obtained at Madison on six days give a mean of 60 per cent and a maximum of 65 per cent on the 8th. At Washington, measurements obtained on nine days give a mean of 58 per cent and a maximum of 63 per cent on the 1st. These are average values for April for both stations.

TABLE 1.—Solar radiation intensities during April, 1932  
[Gram-calories per minute per square centimeter of normal surface]  
Washington, D. C.

Date	Sun's zenith distance											Local mean solar time
	8 a.m.	78.7°	75.7°	70.0°	60.0°	0.0°	60.7°	70.7°	75.7°	78.7°	Noon	
	Air mass											
	A. M.					P. M.						
e.	5.0	4.0	3.0	2.0	1.0	2.0	3.0	4.0	5.0	e.		
	mm.	cal.	mm.									
Apr. 1.....	3.15				1.45	1.12	1.03	0.90	0.79		2.62	
Apr. 4.....	2.49	0.87	0.97	1.11	1.30	1.52					2.06	
Apr. 6.....	7.04				1.08	1.34					5.16	
Apr. 7.....	4.75			0.83	1.07	1.34					4.57	
Apr. 12.....	3.15	0.80	0.92	1.09	1.25	1.44					3.00	
Apr. 14.....	3.45		0.74	0.92	1.13	1.31					3.15	
Apr. 15.....	3.15	0.80	0.88	0.97							2.67	
Apr. 18.....	3.63	0.74	0.87	1.04	1.20	1.48	1.13	0.91	0.75		3.15	
Apr. 19.....	4.37	0.62	0.76	0.92	1.12	1.43					4.37	
Apr. 22.....	6.50					1.37	1.16	0.91	0.72	0.65	3.81	
Apr. 23.....	6.76					1.33					4.17	
Apr. 27.....	3.45		0.67	0.86							2.74	
Apr. 28.....	4.37				1.12	1.38	1.18	1.03			3.81	
Apr. 29.....	7.29			0.81	0.98						4.75	
Means.....		0.75	0.83	0.95	1.14	1.40	1.15	0.97	0.79	(0.72)		
Departures.....		+0.05	+0.05	+0.06	+0.06	+0.04	+0.07	+0.07	+0.05	+0.09		

Madison, Wis.

Apr. 8.....	4.57			1.07	1.34	1.50	1.22				4.17
Apr. 11.....	4.57				1.30						3.15
Apr. 12.....	2.26				1.27	1.51	1.24				2.26
Apr. 14.....	2.26		1.05	1.15	1.30	1.57	1.20				2.16

TABLE 1.—Solar radiation intensities during April, 1932—Contd.  
[Gram calories per minute per square centimeter of normal surface]  
Madison, Wis.—Continued

Date	Sun's zenith distance											Local mean solar time
	8 a.m.	78.7°	75.7°	70.0°	60.0°	0.0°	60.7°	70.7°	75.7°	78.7°	Noon	
	Air mass											
	A. M.					P. M.						
e.	5.0	4.0	3.0	2.0	1.0	2.0	3.0	4.0	5.0	e.		
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.		
Apr. 15.....	4.57				1.17	1.35					3.45	
Apr. 18.....	3.30				1.09	1.38					2.87	
Apr. 22.....	5.16				0.87						5.16	
Apr. 27.....	3.45			1.11	1.30	1.55					2.36	
Apr. 30.....	7.29				1.21						6.02	
Means.....			(1.05)	1.11	1.21	1.48	1.22					
Departures.....			+0.12	+0.07	+0.01	+0.05	+0.03					

Lincoln, Nebr.

Apr. 7.....	4.95		0.91	1.06	1.25	1.48					3.81
Apr. 8.....	4.37	0.51	0.63	0.84	1.14						4.75
Apr. 11.....	3.30	0.86	0.93	1.07	1.25	1.48					3.30
Apr. 12.....	2.87	0.73	0.84	0.98	1.19	1.50	1.20				2.74
Apr. 14.....	3.45		0.71	0.83	1.05	1.30					3.81
Apr. 27.....	3.99				1.23						4.37
Apr. 29.....	8.81					1.48					4.95
Apr. 30.....	5.36	0.82	0.90	1.01	1.15	1.38					5.56
Means.....		0.73	0.82	0.96	1.18	1.44	(1.20)				
Departures.....		+0.01	-0.01	-0.02	-0.02	+0.00	+0.03				

1 Extrapolated.

TABLE 2.—Total solar radiation (direct+diffuse) received on a horizontal surface

Week beginning	(Gram calories per square centimeter) average daily totals												
	Washington	Madison	Lincoln	Chicago	New York	Fresno	Pittsburgh	Fairbanks	Twin Falls	La Jolla	Gainesville	Miami	New Orleans
1932	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Apr. 1.....	532	280	465	296	509	576	389	297	423	442	576	487	375
Apr. 8.....	295	540	515	438	166	565	183	333	511	467		581	412
Apr. 15.....	583	493	299	489	530	568	482	414	403	504	448	474	355
Apr. 22.....	483	407	280	400	479	522	384	417	406	512	611	594	336
	Departures from weekly normals												
Apr. 1.....	+145	-103	+38	±0	+195	+69	+93		+21	+14	+42	+3	
Apr. 8.....	-107	+132	+88	+111	-183	+23	-157		+64	+23		+9	
Apr. 15.....	+155	+93	-120	+167	+147	+15	+126		-68	+54	-102	-1	
Apr. 22.....	+54	-26	-167	+65	+79	-34	+14		-100	+83	+22	±0	
	Accumulated departures on Apr. 25												
	+1,176	-784	-2,079	-3,871	+3,101	+1,715	+1,225		-1,428	+3,311		+4,032	

TABLE 3.—Solar radiation measurements, and determinations of atmospheric turbidity factor,  $\beta$ . Washington, D. C., April, 1932

[Value in italics have been interpolated]

Date and solar hour angle	Solar altitude, $h$	Air mass, $m$ .	$I_m$	$I_y$	$I_r$	$\beta$	Blueness of sky	Atmospheric dust particles per cubic centimeter	Notes (skylight polarization, P = Clouds)
<b>Apr. 6</b>									
4:22 a	23-07	2.54	<i>0.964</i>	<i>0.750</i>	<i>0.604</i>	0.108		630	P = 60.6%.
4:17 a	24-03	2.45	1.007	.750	.616	.095			
3:44 a	30-16	1.98	1.058	.836	.690	.155		5	
3:40 a	31-00	1.94	1.082	.845	.692	.145			
2:52 a	39-40	1.57	1.192	.860	.697	.117			Stopped by clouds.
2:48 a	40-09	1.55	1.207	.861	.697	.110			
<b>Apr. 7</b>									
5:00 a	15-55	3.61	.696	.554	.477	.130		754	P = 54.0%.
4:56 a	16-42	3.47	.720	.564	.492	.130			
4:32 a	21-32	2.71	.878	.677	.566	.125			
4:24 a	23-04	2.55	.938	.701	.588	.110			
3:56 a	28-16	2.11	1.043	.776	.689	.100			
3:52 a	29-02	2.06	1.051	.780	.644	.115		4	
3:17 a	35-28	1.72	1.137	.852	.673	.120			
3:11 a	36-31	1.68	1.141	.837	.678	.130			Clouds.
<b>Apr. 12</b>									
4:46 a	19-58	2.91	1.098	.852	.685	.065		441	Stopped by clouds.
4:34 a	22-13	2.63	1.141	.851	.692	.060			
<b>Apr. 14</b>									
5:14 a	16-17	3.53	.819	.671	.563	.115		806	Do.
5:08 a	17-27	3.31	.863	.683	.572	.100			
4:42 a	21-06	2.76	.969	.755	.620	.100			
4:35 a	22-29	2.60	1.000	.778	.639	.080			
<b>Apr. 15</b>									
5:06 a	16-40	3.46	.936	.737	.611	.078		974	Stopped by Ci. clouds.
5:02 a	17-32	3.29	.962	.740	.616	.075			
<b>Apr. 18</b>									
5:21 a	14-23	3.99	.891	.702	.615	.090		344	P = 61.6%.
5:03 a	17-54	3.23	1.002	.773	.647	.075			
4:59 a	18-40	3.10	1.027	.783	.656	.075			
4:32 a	23-55	2.40	1.118	.835	.685	.075			
4:28 a	24-47	2.37	1.137	.858	.687	.075			
3:44 a	33-06	1.83	1.223	.908	.732	.095		5	
3:40 a	33-52	1.79	1.229	.909	.735	.095			
3:11 a	39-15	1.58	1.296	.952	.752	.092			
3:03 a	40-42	1.53	1.303	.942	.754	.095			
2:44 a	44-00	1.44	1.326	.947	.757	.095			
2:35 a	45-38	1.40	1.338	.950	.758	.090			
2:10 a	49-06	1.32	1.354	.954	.740	.080			
0:50 a	59-52	1.15	1.428	.999	.809	.095			
2:48 p	43-28	1.46	1.284	.956	.743	.105			
2:52 p	42-42	1.48	1.290	.934	.740	.100			
<b>Apr. 19</b>									
5:17 a	15-23	3.73	.794	.624	.528	.095		546	P = 57.9%.
5:12 a	16-21	3.44	.803	.644	.534	.105			
4:50 a	20-32	2.83	.948	.719	.601	.095		5	
4:44 a	21-48	2.68	.978	.743	.614	.095			
<b>Apr. 22</b>									
2:11 a	50-40	1.29	1.249	.912	.758	.050		714	P = 54.1%.
2:07 a	51-18	1.28	1.264	.914	.763	.045			
0:34 a	62-20	1.13	1.330	.904	.727	.110			
0:30 a	62-34	1.13	1.334	.912	.730	.110			
3:06 p	41-04	1.51	1.179	.875	.713	.145			
3:10 p	40-20	1.54	1.200	.873	.711	.125			
3:56 p	31-46	1.90	1.182	.834	.672	.075			
4:00 p	31-02	1.94	1.196	.819	.666	.062		4	
4:26 p	25-50	2.28	1.040	.776	.628	.095			
4:29 p	25-23	2.33	1.002	.765	.622	.105			
4:48 p	21-40	2.70	.978	.711	.676	.068			
4:52 p	20-53	2.78	.948	.700	.660	.070			
5:09 p	17-35	3.28	.828	.683	.624	.090			
5:13 p	16-48	3.43	.820	.617	.614	.082			
<b>Apr. 28</b>									
0:06 a	65-18	1.10	1.347	1.025	.815	.170		231	P = 53.9%.
0:02 a	65-20	1.10	1.354	1.021	.811	.170			
1:50 p	55-22	1.21	1.290	.917	.751	.150			
1:54 p	54-49	1.22	1.306	.916	.750	.140			
2:32 p	48-35	1.33	1.242	.908	.716	.140			
2:35 p	48-00	1.34	1.235	.907	.715	.145			
3:19 p	39-55	1.56	1.204	.859	.673	.095			
3:22 p	39-16	1.58	1.224	.856	.668	.075			
4:00 p	32-12	1.88	1.203	.854	.668	.065			
4:04 p	31-21	1.92	1.183	.849	.663	.068		5	
4:32 p	25-49	2.29	1.140	.778	.632	.045			
4:36 p	25-02	2.35	1.118	.770	.619	.050			Stopped by clouds.
4:51 p	22-14	2.63	1.070	.719	.624	.060			
<b>Apr. 29</b>									
4:00 a	32-16	1.87	1.003	.772	.640	.165		1029	P = 58.6%.
3:56 a	33-08	1.82	1.035	.779	.650	.155			

POSITIONS AND AREAS OF SUN SPOTS

Communicated by Capt. J. F. Hellweg, Superintendent United States Naval Observatory. Data furnished by Naval Observatory, in cooperation with Harvard, Yerkes Perkins, and Mount Wilson Observatories. The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column.

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Long. tude	Latitude	Spot	Group	
<b>1932</b>							
	<i>H m</i>	$^{\circ}$	$^{\circ}$	$^{\circ}$			
Apr. 1 (Naval Observatory)	10 41	+16.0	115.0	+13.0	77		77
Apr. 2 (Naval Observatory)	11 53	+29.5	114.7	+13.0	62		62
Apr. 3 (Naval Observatory)	12 22	+53.0	129.7	-10.0		108	108
Apr. 4 (Naval Observatory)	11 18	+80.0	139.1	-10.0		93	93
Apr. 5 (Naval Observatory)	12 27	No spots					
Apr. 6 (Naval Observatory)	10 47	No spots					
Apr. 7 (Naval Observatory)	10 46	No spots					
Apr. 8 (Yerkes Observatory)		No spots					
Apr. 9 (Yerkes Observatory)		No spots					
Apr. 10 (Mount Wilson)	18 0	-67.0	269.2	-8.0		2	
		+23.0	359.2	-14.0		4	6
Apr. 11 (Yerkes Observatory)		No spots					
Apr. 12 (Naval Observatory)	11 45	No spots					
Apr. 13 (Naval Observatory)	10 30	No spots					
Apr. 14 (Naval Observatory)	10 38	No spots					
Apr. 15 (Naval Observatory)	11 4	+0.0	274.0	-18.0	15		
		+3.0	277.0	-16.0	25		40
Apr. 16 (Naval Observatory)	10 47	+16.0	277.0	-16.0	15		15
Apr. 17 (Naval Observatory)	11 26	+28.0	275.4	-19.0	25		
		+30.0	277.4	-15.0	31		56
Apr. 18 (Naval Observatory)	10 29	No spots					
Apr. 19 (Naval Observatory)	10 38	No spots					
Apr. 20 (Naval Observatory)	10 59	No spots					
Apr. 21 (Naval Observatory)	11 52	-50.0	144.3	+9.0		154	
		+60.0	254.3	-8.0		216	370
		-36.0	145.8	+9.0		340	
		+73.0	254.8	-8.0		216	556
Apr. 22 (Naval Observatory)	10 37	+36.0	145.3	+9.0		463	463
Apr. 23 (Naval Observatory)	11 5	-23.0	145.4	+9.0		463	463
Apr. 24 (Naval Observatory)	14 12	+6.0	145.7	+9.0		908	908
Apr. 25 (Harvard Observatory)	13 27	+16.0	144.5	+9.0		556	556
Apr. 26 (Naval Observatory)	10 13	+29.0	145.0	+10.0		556	556
Apr. 27 (Naval Observatory)	10 29	+42.0	144.6	+10.0		617	617
Apr. 28 (Naval Observatory)	10 11	+56.0	145.5	+10.0		432	432
Apr. 29 (Naval Observatory)	11 38	+70.0	145.5	+10.0		401	401
Mean daily area for April							193

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR APRIL, 1932<sup>1</sup>

[Data furnished through the courtesy of Prof. W. Brunner, University of Zurich, Switzerland]

April, 1932	Relative numbers	April, 1932	Relative numbers	April, 1932	Relative numbers
1	8	11	0	21	<i>WEcc</i> 18
2	8	12	0	22	34
2	16	13	0	23	29
4	9	14	0	24	
5	0	15	8	25	<i>b</i> 31
6	0	16	8	26	31
7	0	17	9	27	32
8	0	18	8	28	27
9	0	19	0	29	24
10	0	20	0	30	14

Mean: 29 days 10.8.

<sup>1</sup>Dependent alone on observations at Zurich and its station at Arosa.

a = Passage of an average-sized group through the central meridian.  
 b = Passage of a large group or spot through the central meridian.  
 c = New formation of a center of activity; E, on the eastern part of the sun's disk; W, on the western part; M, in the central zone.  
 d = Entrance of a large or average-sized center of activity on the east limb.